

WHAT IS CLAIMED IS:

1. A projection exposure apparatus,
comprising:

5 a continuous emission excimer laser for
providing laser light of a predetermined
wavelength;

an illumination optical system for
illuminating a pattern of a reticle with laser light
of the predetermined wavelength;

10 a projection optical system for
projecting the illuminated pattern of the reticle
onto a substrate; and

a laser for injecting light of the
predetermined wavelength into a resonator of said
15 continuous emission excimer laser;

wherein said projection optical system
is provided by a lens system being made of a
substantially single glass material.

20 2. An apparatus according to Claim 1,
wherein said laser comprises a pulse emission
excimer laser, wherein said apparatus further
comprises a wavemeter for measuring the wavelength
of light from said pulse emission excimer laser,
25 and wherein a band narrowing element in a resonator
of said pulse emission excimer laser is actuated
on the basis of a signal from said wavemeter so that

the wavelength of said pulse emission excimer laser becomes equal to the predetermined wavelength.

3. An apparatus according to Claim 1,
5 further comprising a wavemeter for measuring the wavelength of the laser light from said continuous emission excimer laser, and changing means for changing a resonator length of said continuous emission excimer laser on the basis of a signal from
10 said wavemeter so that the wavelength of the laser light from said continuous emission excimer laser becomes equal to the predetermined wavelength.

4. An apparatus according to Claim 3,
15 wherein said changing means includes at least one of shifting means for shifting a mirror in said resonator and pressure changing means for changing a pressure of an excitation gas.

20 5. An apparatus according to Claim 1, wherein the reticle is illuminated with slit-like light having one of a rectangular shape and an arcuate shape, and wherein said apparatus further comprises scanning means for scanningly moving the
25 reticle and the substrate relatively to the slit-like light and to said projection optical system, such that the substrate is exposed to the

pattern of the reticle.

6. An apparatus according to Claim 1,
wherein the half bandwidth of the wavelength
5 spectrum of the laser light is not greater than 0.1
pm, and an image of a linewidth of 0.13 micron can
be produced.

7. An apparatus according to Claim 1,
10 wherein the half bandwidth of the wavelength
spectrum of the laser light is not greater than 0.08
pm, and an image of a linewidth of 0.09 micron can
be produced.

8. An apparatus according to Claim 1,
15 wherein said excimer laser is an ArF excimer laser,
and wherein the glass material is SiO₂.

9. An apparatus according to Claim 1,
20 wherein said excimer laser is an F₂ excimer laser,
and wherein the glass material is CaF₂, BaF₂ or
MgF₂.

10. An apparatus according to Claim 1,
25 wherein said lens system includes lens elements of
a number not less than ten, and wherein first one
or first two lens elements of the lens system in

an order from the substrate side are made of CaF_2 ,
 BaF_2 or MgF_2 .

11. A device manufacturing method,
5 comprising the steps of:
- exposing a substrate to a device pattern
by use of a projection exposure apparatus as recited
in Claim 1; and
 - developing the exposed substrate.